



SHARE conditioning

The Space Station Heat pipe Advanced Radiator Element (SHARE) flight experiment on STS-29 will test an "air conditioner" being considered for *Freedom*. Story on Page 3.



Tickets to ride

Rats and chicken eggs will get a taste of zero-G on the STS-29 mission. Student experiments will study the effects of zero-G on bone healing and embryo development. Story on Page 4.

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Members of the STS-29 crew talk with members of the news media following their Wednesday press conference in Bldg. 2. From left are reporters Paul Halvorsen of USA Today and Jim Slade of ABC News, and crew members Jim Buchli, Bob Springer, John Blaha and Mike Coats.

Coats & Co. anticipate smooth ride

STS-29 crew confident safety focus hasn't blurred

By James Hartsfield

The crew members for STS-29 say they anticipate a smooth ride to orbit aboard *Discovery* in February, and they're confident NASA's sharp focus on safety hasn't blurred following the agency's past two successes.

"I think NASA's gone out of its way to keep the Astronaut Office informed of anything that comes up," STS-29 Commander Mike Coats said Wednesday. "We're confident right now that NASA's doing everything it can, and we're doing everything we can, to have as safe a flight as possible for the foreseeable future."

Coats and his crew—Pilot John Blaha and Mission Specialists Jim Buchli, Bob Springer and Jim Bagian—addressed the media Wednesday during the usual pre-flight news conference.

"We're going to see some problems as long as we fly the Shuttle. It's inevitable with spaceflight," Coats said. "But the other side is that ... when you find a problem, they're going to go make a design change and solve it. The learning curve is continually going up."

"One of the things we learned in military flying is that the more you fly, the fewer problems you have," he added. "I think the same thing's true with the space program."

The primary objective of STS-29 is to deploy a third Tracing and Data Relay Satellite (TDRS-D) in a mission similar to STS-26.

STS-29 will be the first trip to space for three astronauts—Blaha, Springer and Bagian. Each is looking forward to launch, although their current levels of excitement differ.

"Everybody works on a big team here, supporting

everybody who flies," Blaha explained. "And, honestly, right now I don't have any different feelings than I've had prior to any launch. But I may feel differently when the solid rocket boosters start to light up on the pad."

Coats, a Shuttle veteran, reassured him, "You will."

Springer said he has spent years sharing in the tremendous buildup that goes into every Shuttle flight. He is looking forward to "a chance to experience what we're going to experience and share that with all the people who have participated so much."

Years of intensive preparation could, at times, appear to lessen the newness of a first flight aboard the Shuttle, Bagian said.

"But I'm sure it will be quite a thrill when it lights off and gets going."

"That's something you can only experience," he added. "The simulator can't do that for you."

Flight controllers at JSC also are excited about the first flight of 1989, the first full year of resuming regular missions.

"Everyone is really upbeat. This is a super operation to be involved in," said Chuck Shaw, lead flight director. "We're all gearing up for a multi-flight environment. It's nice to be able to do that again. It's good to have your plate full."

Along with TDRS-D, STS-29 will carry a host of experiments and secondary objectives to create a busy five days in space for the crew. "We've got a lot to accomplish," Coats said.

Secondary payloads include the Space Station Heat pipe Advanced Radiator Element (SHARE) flight

Please see **STS-29**, Page 4



President asks \$13.3 billion for NASA in 1990

NASA Administrator Dr. James C. Fletcher on Monday outlined a \$13.3 billion fiscal year 1990 budget request for the agency, including \$2.1 billion for Space Station *Freedom*.

Under the proposed budget, JSC would receive JSC \$36.9 million for construction, \$820 million for space station work, and funding for 142 new hires.

Fletcher said NASA is "back on track" in all areas laid out in the National Space Policy announced by President Reagan in 1988. The agency's efforts during the past year include a strong beginning on Space Station *Freedom*, the continuation of several major science programs, and progress in studies of long-term human exploration of the Solar System. But these efforts are only a start, and there's much left to be done, he stressed.

"We have had two successful Shuttle flights, but only two," he added. "We still have many flights to go to demonstrate reliability and to work off a backlog of important scientific and national defense missions."

The NASA budget request is based on President Reagan's recently presented 1990 federal budget. Fletcher

said he expects little change in NASA's funding after President-elect George Bush takes office Jan. 20.

"I don't see any differences coming down the pike with the president-elect. He's very sympathetic toward the program," Fletcher said. "But, of course, it's his decision to make, and I'm not going to make it for him."

The 1990 NASA budget request calls for a \$2.4 billion, or 20 percent, increase in the agency's funding. Most of the increase is needed to build up the Shuttle flight rate and develop the advanced solid rocket motor (ASRM); develop the space station; continue science and applications and aeronautics and space technology programs; and to continue the necessary support activities for all of these efforts. All represent programs approved by Congress last year, he said.

"This is a very tight budget," Fletcher warned. "We've scraped out all that can be cut, and we may have gone too far. Any further cuts would require a restructuring of our NASA program, and it certainly wouldn't keep us in the category of a first-class spacefaring nation."

Please see **BUDGET**, Page 4.

New manifest catalogs flights through STS-88

NASA updated its mixed-fleet manifest Monday, detailing plans for seven Space Shuttle missions this year and a gradual buildup to 14 flights a year by 1993.

The schedule extends through STS-88 in September 1994. The manifest ends with the 1994 fiscal year, but notes that a total of 14 flights are planned for calendar 1994.

The planning document uses only a February 1989 target for the STS-29 launch. An exact launch date is expected to be set during the Feb. 8-9 flight readiness review.

Three interplanetary launch windows are supported, two of them in 1989. The STS-31 launch of the Hubble Space Telescope aboard *Discovery* on Dec. 11, reflects a launch date trade effected late last

year with the STS-36 Department of Defense (DOD) mission.

The 1989 flight order becomes:

- STS-29 and TDRS-D aboard *Discovery* in February;
- STS-30 and Magellan aboard *Atlantis* on April 28;
- STS-28, a dedicated DOD mission, aboard *Columbia* on July 1;
- STS-33, another DOD mission, aboard *Discovery* on Aug. 10;
- STS-34 and Galileo aboard *Atlantis* on Oct. 12;
- STS-32, which will use *Columbia* to deploy Syncom IV-05 and retrieve the Long-Duration Exposure Facility (LDEF), on Nov. 13; and
- STS-31 and the Hubble Space Telescope on Dec. 11.

Magellan, a Venus radar mapping

Please see **MANIFEST**, Page 4.

Accelerate planning activities, Cohen tells strategic workshop

JSC and the rest of the manned spaceflight community must accelerate planning activities and be ready to take on a new space exploration program, JSC Director Aaron Cohen said at a Monday strategic planning workshop in the Gilruth Recreation Center.

Cohen invited the nearly 200 civil servants, contractors, academicians and economic development representatives attending the second NASA/Contractor Strategic Planning Workshop to work together through JSC's planning process to help shape the future.

"As leaders in the manned spaceflight community, we have a responsibility to ensure that the United States remains the leader in manned space-



flight exploration," Cohen said.

JSC must pursue challenging manned exploration programs that maintain America's leadership by evolving existing systems or participating in major new programs, Cohen said.

Development and implementation of JSC's Strategic Game Plan must enhance the center's unique combination of space exploration capabilities in project management, engi-

neering, crew and mission operations, and space and life sciences, he said, and those efforts must build and sustain an efficient, reliable and safe space transportation infrastructure as a flexible tool in support of space exploration and exploitation.

Cohen described the JSC/contractor gathering, the second full-day workshop since the strategic planning process started in December 1986, as a team-building exercise.

"We're just getting started, really," he told the contractors. "NASA is going to continue this planning effort, JSC is going to continue, and I invite you to continue this along with us."

JSC Deputy Director P.J. Weitz said the workshop was designed to review with contractors the progress of JSC's strategic plan implementation.



JSC Director Aaron Cohen talks Monday with participants at the second NASA/Contractor Strategic Planning Workshop at the Gilruth Recreation Center. The workshop was designed to review with contractors the progress of JSC's strategic plan implementation.



JSC Photo

CREW PORTRAIT—The members of the STS-29 crew pose for their official portrait. From left are Mission Specialist James P. Bagian, Pilot John E. Blaha, Mission Specialist Robert C. Springer, Commander Michael L. Coats, and Mission Specialist James F. Buchli.

JSC

People

Todd receives top secretarial award

Suzanne J. Todd, a secretary in the Space Station Systems Engineering and Integration Office, has received the Marilyn J. Bocking Secretarial Excellence Award.

She received a plaque from JSC Director Aaron Cohen, and \$500.

Todd assists the manager of the Systems Engineering and Integration Office through secretarial, clerical and administrative support. She recently played a major role in assuring the successful conversion of a word processing system, and in implementing a newly established action item



Todd

tracking system. Todd also was cited for competence in accessing computer schedules, agendas and message in the complex, multi-work package Space Station Program.

Swanson benefits from leave donation program

Dale Swanson, a budget analyst in the Center Operations and SR&QA Business Management Office, has received more than 700 hours of leave donated by his co-workers.

Swanson needed the additional leave because of an extended medical circumstance. Employees in the Human Resources Office, and the Administration, Mission Operations and Center Operations Directorates contributed unused annual leave after Swanson's supervisor, Richard Hall, notified them of the situation.

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays:

General Cinema (valid for one year): \$3 each.

AMC Theater (valid until May 31):

\$2.95 each.

Sea World—San Antonio (year): children, \$14.75; adults, \$17.25.

The Arkansaw Bear (Feb. 18, 7 p.m., Bayou Theatre, UHCL): \$3.

Pericles, Prince of Tyre (April 22-28, 8 p.m., Satellite Theatre, UHCL): \$4.

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Dates & Data

Today

Mars program—The Houston Museum of Natural Science's Burke Baker Planetarium will feature a "Mission to Mars" program Jan. 6-May 28 on Wednesdays, Fridays, Saturdays and Sundays. The three-part program explores past Mars probes, plans for future missions and the remaining mysteries of the red planet. For more information, call 639-4600.

Cafeteria menu—Entrees: broiled codfish, fried shrimp, baked ham, tuna and noodle casserole (special). Soup: seafood gumbo. Vegetables: corn, turnip greens, stewed tomatoes.

Monday

King holiday—Most JSC operations will be suspended for observance of the Martin Luther King, Jr. Birthday holiday.

Exercise class—Class meets 5:15-6:15 p.m. Mondays and Wednesdays at the Gilruth Recreation Center for eight weeks. Cost is \$24. Participants may sign up anytime. For more information, call x30303.

Tuesday

Cafeteria menu—Entrees: potato baked chicken, barbecue spare ribs, Mexican dinner (special). Soup: tomato. Vegetables: squash, ranch beans, Spanish rice, broccoli.

Wednesday

Cafeteria menu—Entrees: baked scrod, liver and onions, ham steak, baked meatloaf with Creole sauce (special). Soup: seafood gumbo. Vegetables: beets, Brussels sprouts, green beans, whipped potatoes.

Thursday

Cafeteria menu—Entrees: chicken and dumplings, corned beef with cabbage, smothered steak with dressing (special). Soup: beef and barley. Vegetables: spinach, cabbage, cauliflower au gratin, parsley potatoes.

Jan. 20

Cafeteria menu—Entrees: pork chop with yam rosette, Creole baked cod, tuna and salmon croquette (special). Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

Jan. 21

Arbor Day celebration—Armand Bayou Nature Center will celebrate Arbor Day with informal talks, planting demonstrations and a tree dedication Jan. 21-22. Free Loblolly pine seedlings will be distributed. Admission to the nature center, 8600 Bay Area Blvd., is \$2.50 for adults.

Jan. 24

BAPCO meets—The next meeting of the Bay Area PC Organization (BAPCO) will be at 7:30 p.m. Jan. 24 at the League City Bank & Trust. For more information, call Earl Rubenstein, x34807, or Ron Waldbillig, 337-5074.

Flag football and soccer—Registration for the Saturday flag football and mixed soccer leagues ends Jan. 24 at the Rec Center. NASA-badged teams will sign up at 7 a.m., and non-badged teams at 5:30 p.m. The last sign-up will be Jan. 24, for mixed soccer. For more information, call x30303.

Jan. 25

NMA meets—The next meeting of the JSC Chapter of the National Management Association will be at 5 p.m. Jan. 25 in the Rec Center ballroom. Dinner will begin at 6 p.m. Local area high school students will make presentations on the American enterprise system. For reservations, contact Ann Hammond at x32933 by Jan. 18. For more information, call Gerald Chapman, x34848.

Feb. 10

Information systems conference—JSC and the University of Houston-Clear Lake will co-sponsor an all-day conference entitled, "Information Systems for Project Management: Coordinating Large, Complex Computing Systems," on Feb. 22 at the Westin Oaks-Galleria in Houston. Brenda Dervin of Ohio State University will give the keynote speech on "Making Information Systems Work: The Human Dimension." Cost is \$125 per person, or \$100 for university and federal employees. Registration deadline is Feb. 10. Federal employees should call Glen Van Zandt, x33069, to register. For more information call 488-9433.

Feb. 15

Lunar pole conference—A Lunar

Polar Probe Conference designed to formalize plans for the development, funding and launch of a small satellite to explore the polar regions of the Moon will be conducted March 11-12 at the Nassau Bay Hilton. The conference is sponsored by the National and Houston Space Societies, Milwaukee Lunar Reclamation Society, University Space Society, New Orleans Space Society, Space Studies Institute, Space Frontier Foundation, ETM Inc. and Third Millennium Inc. Speakers will include Dr. Wendell Mendell of JSC. Registration is \$15, and banquet reservations are \$25. Deadline for advance registration is Feb. 15. For more information, call 643-6373.

Feb. 23

Call for papers—The American Society of Quality Control (ASQC) is seeking innovative papers written on subjects such as applications in quality and productivity or the use of data systems for improving quality and productivity and competitiveness. The papers will be presented at the second annual South Texas Quality, Productivity and Data Systems Conference, Feb. 23-24 at the University of Houston's Hilton Conference Center. For consideration, and a brief abstract and biographical sketch, both less than 300 words each, a one page outline and a photograph to South Texas Q&P Conference, Attn. Eugene Berger, Box 890506, Houston, 77289. For more information, call Berger, 333-0967.

April 27

Space Flight Symposium—The Texas Bay Area Chapter of the Society of Hispanic Professional Engineers (SHPE) will cosponsor "The Challenge of Space Flight: A Space Symposium" to be held April 27-28 at JSC. The joint effort will be aimed at disseminating information to minority groups, educators, technical professionals and managers of EEO programs concerning current and future manned space activities and skills needed by JSC to meet the manpower needs of the 21st century. For more information, call Otilia Sanchez, x39319.

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

Property

Sale/Lease: 10 acres on FM 517, 1/2 mile from Hwy. 146, stocked ponds, barn, util., and more. 484-7834.

75' x 150' heavily wooded lot w/view of Taylor Lake, all util. avail. 333-5821.

Sale: Bacliff, 3-1-1, 1,000 sq. ft. on 100 x 100 corner lot w/trees, vinyl siding, storm windows, near public boat ramp, nothing down, assume VA loan, \$480/mo. Ed, x35981 or 339-2057.

Lease: CLC, 1 BR condo, ceiling fan, microwave, appl., tennis, exercise room, W/D conn., low dep., 2 weeks free! Jim Briley, 488-7901.

Rent: Dickinson, 2 BR duplex, \$300, 1 BR duplex, \$250, small 1 BR duplex, \$200. 337-4624.

Lease: Piper's Meadow/CLC, 3-2-2, FPL, fence, new paint, patio, gas util., dining room, \$550/mo. 482-6609.

Sale: Heritage Park, 3-2-2 custom home, tile entry, walls of windows in living and dining rooms, beautiful custom kitchen, new deck and fence, both baths redone and vanities custom, new paint inside and out, wallpaper, miniblinds, carpet throughout, \$58,500. Tony or Lori, 482-5139.

Lease: Best location on the lake, 1 BR condo at bayfront, \$625/mo. 333-2490.

Sale: Near Lake Livingston, 90 min. from NASA, house on 10 acres and adjacent cottage on 33 acres, both properties fully fenced, mostly wooded with deep water well, one complete and one incomplete, pond and running creek, \$135K. 532-4420.

Sale: Middlebrook, 3-2-2, study, FPL, wet bar, covered patio, large lot, ex. cond., FHA assum., 10% 480-9363.

Lease: Vail, Colo., prime skiing, Feb. 25-Mar. 4, '89, full kitchen, dinette, FPL, fabulous clubhouse, sleeps 5, \$795. Jan, x33434 or 333-5266.

Rent: Mobile home lot, \$85/mo., \$50/dep., Oklahoma and Kinne, Bacliff. 488-1758.

Sale: Friendswood/Sun Meadow Estates, wooded lot in estab. neighborhood, cul-de-sac,

bordered by stream and golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, \$31,500. Doug, x32860 or 486-7412.

Cars & Trucks

'87 Toyota customized van, front and rear A/C, ex. cond., \$11,500. 333-5821.

'75 Ford LTD, 4 dr, 460 cu. in., P/S, P/seats, P/B, P/W, P/trunk, A/C, tilt steering wheel, cruise control, auto. trans., AM/FM/8TK, P/door locks, good tires, blue velour int., 88K mi., \$800, OBO. Don, x36769 or 488-4101.

'29 Mercedes Replicar, still in kit, Ford frame, retail, \$8,000, paid \$6,500, asking \$5,500. 484-7834.

'79 Dodge 3/4 ton, silver, customized, maroon int., Captain's chairs, bed, table, storage, CB radio, ex. mech. cond., Michelin tires, low mi., \$2,950. Dean Thompson, 332-2229.

'88 Mitsubishi Mighty Max P/U, 13K mi., ex. cond., 2.0 liter eng., 28-30 mpg, AM/FM cass., 24K mi./2 yr. warranty, \$6,000, OBO. 331-3268.

'86 Hyundai Excel, 4 dr hatchback, AM/FM cass., A/C, 32K mi., ex. cond., \$3,400. 332-9231.

'75 Starcraft pop-up camper, sleeps 6, extra clean, ex. cond., \$1,495. Brian, 282-2949 or 474-7020.

'84 Buick LeSabre Ltd, ex. appearance and mech., AM/FM, A/C, full power, tilt steering, wire wheels, over 100K, one owner interstate miles, \$4,250. Gail, 282-1901.

'80 Monte Carlo, ex. cond., loaded, 79K mi., \$2,000. 488-2000.

'87 Sterling 825SL, luxury and performance automobile, all options, low mi., take up notes or refinance. 486-1404.

'87 BMW conv., red, beige leather int., 19K mi., \$24,500; '83 Camaro, 6 cyl., auto., clean, sound, 61K mi., \$3,600; '82 Pontiac Bonneville station wagon, 6 cyl., \$2,500. Owen, x36315 or 488-3062.

'88 Toyota Supra Turbo, AM/FM cass., A/C, P/S, antilock brakes, elec., moon roof, 26K mi., ex. cond. 486-4371.

'85 Dodge Omni GLH Turbo, full roll cage, spare roller, eight wheels, less than 1,000 mi. on rebuild, \$4,500. Spares nego., x32949.

'86 Chrysler Fifth Avenue, fully equip., low mi., like new. 482-1535.

Cycles

'79 Yamaha XS 750 Special, 1 owner windjammer, AM/FM cass., new tires, lots of extras, \$1,250, OBO. Rich, x34818 or 480-8335.

'82 Kawasaki 440 LTD, 8,700 mi., new tires, ex. cond., runs great, \$650. Joe, x34538 or 338-2620.

Boats & Planes

'84 Wellcraft 18' Fisherman W/150hp Yamaha, Sportsman trailer, white line chart recorder, flash sounder, VHF radio and antenna, 2 batteries, swim platform, SS prop plus spare, live well, Bimini top, \$9,000. Steve, x32460 or 482-3696.

Mistral Bermuda windsurfer, complete rig, ex. for beginners, \$500. 488-6526.

Audiovisual & Computers

Apple II/IIe modules (Modem, Synch Printer I/F, Disk I/F, Parallel Printer I/F) and software DOS 3.3 Sys/Basic, EZ Draw, VISICALC, Data Plot, Easy Writer, Statics, etc., BO. Don, x36769 or 488-4101.

Commodore 64 computer, disk drive, printer and software, needs parts, BO. 488-5445.

Wordstar Professional, Release 5, \$150. 485-4995.

Household

Queen size sofa sleeper, oatmeal and tan w/ light oak trim, ex. cond., \$250. M. Connealy, 484-3360.

Mirrors, gold-veined, 45" x 91 1/2", two each, like new, \$200 for two or \$125/each, OBO. Doug, x32860 or 486-7412.

Whirlpool matching washer and elec. dryer, 1984 model, almond color, ex. cond., \$200/each or \$350 for the pair. Craig, 282-3731 or 485-5636.

12' x 12' aqua rug, (indoor), \$75, BO, new, never used, still in the plastic wrap. Ed, x36250 or 481-4889.

Triple dresser, dark wood, ornate carvings on doors/drawers, large matching mirror, like new, \$150. Jana, x31653 or 532-3008.

Couch, multicolored tans/maroon colored, \$70. 280-1259 or 996-8938.

Waterbed, king size, low motion, solid oak, contemporary, like new, \$500, OBO. Mariann, x39145 or 486-4586.

Antique hump back steamer trunk, 34L x 21W x 28H, has 95% hdw/trim, \$195; file cabinet, 2 dwr w/lock, \$20; elec. dust collector for furnace, H/P, "Edison", w/pressure switch, 800-1600 CFM, was \$380, now \$150; Greco baby stroller-bed "Elite", 6 mos. old, \$40; dehumidifier, "White/Westinghouse", 21H x 12 x 12, 20 pts/

25 hr, auto. shutoff, used 4 mos., \$99; mirrors, gold-veined (2), 45" x 91 1/2", \$100 ea. Doug, x32860 or 486-7412.

Dinette set, metal table w/expansion leaf, adjusts from 4 to 6 person seating, 6 vinyl upholstered metal chairs, orange/green pattern, recently re-upholstered, \$125, OBO; Northland stainless flatware, service for 8, \$15; misc. glass bakeware, BO. Julie, x31540 or 482-0833.

Double mattress and box springs, good cond., \$50. Julie, x31276.

G.E. electric stove, like new, \$150. x35981 or 474-3011.

Sears 19.2 cu. ft. almond color refrig. w/ice maker, ex. cond., has been under maint. contract, \$300. Al, 480-2067 or 863-7826.

Wanted

Want someone to split roundtrip airfare on Southwest Airlines "Buddy Pass" to Albuquerque, N.M. on Feb. 17-20. Individual cost, \$134. Debbie, x38631 or 484-8105.

Want used in good cond., baby jogger. Lori or Tony, 482-5139.

Want to buy elec. trains. Don, x37832 or 996-1425.

Want dish racks for G.E. dishwasher. Murray, 280-7337.

Van pool riders wanted from Sugarland or Loop 610 Park & Ride to JSC area. Alice, x35234.

Want musket (1863 Repro), 3-banded Enfield rifle-musket muzzleloader, new or used. Ed, x36250 or 481-4889.

Want used car seat for baby 20 lbs.-40 lbs., and used highchair, need inexpensive items in good cond. only. x39421 or 334-4361.

Want one Discovery Christmas tree ornament, will pay \$15. 335-1048.

Photographic

3X Telephoto Converter, and a 75mm to 260mm zoom Vivitar lenses, Cannon mount, BO. 484-7834.

Pets & Livestock

Chow-Chow puppies, born 11/29/88, full-blood, wrinkled faces, M and F, black and reddish brown, \$125, very cute. x37815 or 475-2357.

Doberman Pincher, AKC, red and black puppies, docked tails and declawed, champion bloodlines, parents on premises. Theresa, x37632.

Siberian Husky, ACK puppies, black and white, blue eyes, born 12-2-88, parents on premises,

\$250-\$300. 482-3485.

Free dogs to good home, rescued from abandonment and nursed back to health, many to choose from. x32949.

AKC Cocker pups, born 10/19, 3 males left, \$150, OBO. Tamela, x36159 after 3 p.m. or 480-8980.

Musical Instruments

Piano, \$550; antique player piano, \$1,300; Kimball two keyboard organ, \$550. 485-4995.

Kimball organ, swinger 700 Entertainer/II, ex. cond., \$450, OBO. Sharon, x34111.

Kimball Spinnet piano, 15 yrs. old., ex. cond., \$900, OBO. Rich, x34818 or 480-8335.

Personal

Retirement luncheon for Richard J. "Andy" Andrews and B.J. Pierce on January 10, 1989, at 11:30 a.m. at the Kings Inn, NASA Road 1, tickets avail. from D. Perry, x36870, in B30, rm. 2061, until noon January 5.

Miscellaneous

Car mats, Kraco front and rear, compact car, black carpeted, new, \$15 set, Craftsman 3.5hp lawnmower, not running, \$10; covered cat litter box, rose carpeted scratching post, food dish, \$15; Mr. Coffee, 10-cup, \$10; 3-man nylon tents, \$5; Sunbeam elec. 16" grandfather clock, plastic case. Julie, x31540 or 482-0833.

Kirby vacuum, recently reconditioned, all attach. incl., \$75. Dean Thompson, 332-2229.

1965 3-spd. manual Corvair trans., BO. 484-7834.

Toro 21" self propelled lawnmower, fair cond., \$50; recliner chair, very good cond., \$150. 488-4487.

Reflector telescope, 13" Dobsonian by Coulter Optics, one eyepiece, \$400. Rodney, x38889.

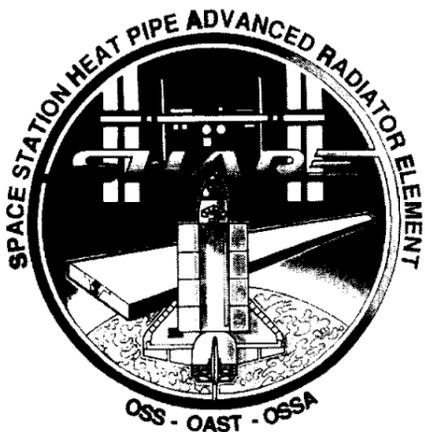
Wedding gown, veil, size 5, silk chiffon and lace accented with seed pearls, have pictures, \$300. x31876.

Child's ski suit, 2-piece w/matching knit cap and gloves, size 12, worn once, half new price, \$60. 480-3110.

Rifle, customized P17 Enfield .30-06, new barrel, Fajen stock, Redfield scope mount base, \$175. Vernon, 337-2855 or 335-7344.

Roundtrip airline ticket to San Diego on Jan. 21, return on Jan. 28, no changes allowed, \$200. Cox, 488-5688.

Wedding dress, ivory, summer style, tea-length, size 8, w/gloves and shoes, \$150. 481-4889.



Ammonia-powered 'air conditioner' gets flight test on next mission



JSC Photo by Scott Wickes

Space Station Heat pipe Advanced Radiator Element

By James Hartsfield

After a decade of development at JSC, an innovative system that could become Space Station Freedom's "air conditioner" will ride one side of *Discovery's* payload bay on STS-29.

The Space Station Heat pipe Advanced Radiator Element (SHARE) flight experiment, mounted on the starboard sill of the Orbiter's payload bay, will test whether a natural process can serve as a dependable, durable cooling system for America's permanent space station, said Principal Investigator Gary Rankin.

Unimpressive in its outward appearance—it looks somewhat like a slat from a giant venetian blind—the heat pipe uses no moving parts, working instead through the surface tension of ammonia. Heat pipe systems have cooled satellites, but have never before been applied to manned spacecraft.

The SHARE hardware includes two small "pipes" bored through an aluminum core that runs through the center of a 51-foot-long, foot-wide radiator. The two pipes, one slightly larger than the other, are connected by a very narrow slot. On one end is an evaporator where the pipes branch out like fork tines.

During the orbital test, three electric heaters will warm the evaporator end of SHARE. In the evaporator, a fine wire-mesh wick that works along the same principle as the wick of an oil lamp will pull liquid ammonia from the smaller pipe into the larger pipe, where it is vaporized by the heat. The vapor will carry the heat the length of the radiator through the larger vapor pipe. The

radiator dissipates the heat into space, leaving cooled, condensed ammonia. Small circumferential grooves on the wall of the larger pipe allow condensed ammonia to drop back through the narrow slot into the smaller pipe, which recirculates the liquid ammonia back to the evaporator.

SHARE occupies an envelope on the sill of the payload bay designed to hold a manipulator arm. A small instrument and control package has been mounted in the forward bay.

"The Orbiter's designed to carry double remote manipulator system (RMS) arms, but only the port side envelope has ever been used for that purpose," Rankin said. "SHARE will be on the starboard side, and it will take up very little room in the payload bay."

Rankin has worked with heat pipe development at JSC for 10 years, and SHARE is a result. During those 10 years of work, more than 200 JSC workers have contributed to what has now become SHARE, Rankin said.

Among those who have contributed are employees in the Structures and Mechanics Division, the old Flight Projects Engineering Office, the Crew Systems Division and the Technical Services Division. Construction of the actual flight hardware for SHARE began almost six years ago, he said.

While Grumman built the actual radiator element, the avionics, mounting pedestals, support beam and all other hardware were built by JSC's Tech Services. Thermal blankets for portions of the experiment were built in the Crew Systems Division.

Those who have contributed heavily to SHARE include: Tim Pelschek in structures and mechanics, where structural analyses and tests of SHARE were performed; Jerry Woodfill, who served as SHARE avionics manager and is now in the New Initiatives Office; Lou Wade and Mike Richardson of new initiatives, who teamed up to work on SHARE mission management; Tom Grubbs of crew systems, SHARE mechanical design engineer; Bill LeCroix, now retired but formerly of crew systems and SHARE mission management; and Joe Alario, project engineer for the contractor, Grumman. Sharing lead responsibility with Rankin for the flight experiment is Steve Glenn, SHARE project engineer.

"It would really be impossible to name everyone at JSC who has had a part in SHARE," Rankin said. "Through the years, it has been almost totally an in-house project of the center, a large team effort."

An early heat pipe experiment flew aboard STS-8 in August 1983. Although it was small in scale, using only a six-foot long radiator, the STS-8 experiment operated successfully for two hours and demonstrated the concept's potential.

A full-scale radiator element then was built and tested in thermal environments at JSC in 1984, Rankin said. The SHARE flight experiment took shape later that year and was scheduled to fly in 1986. But the two-and-a-half-year halt in Shuttle flights delayed the experiment.

SHARE already is mounted aboard *Discovery* at Kennedy Space Center. "To be next in line is

a major accomplishment. It's been a major career milestone to follow this from a concept all the way through to a flight experiment, challenging and rewarding at the same time," Rankin said. "We want to demonstrate the generic capability of this family of heat pipes. We have very high confidence that the basic concept for the space station system is a viable one."

The radiator for SHARE weighs about 135 pounds, but with its support pedestals, support beam, heaters and instrument package, the total experiment weighs about 750 pounds. During STS-29, crew members will switch on the heaters using controls on the aft flight deck. The experiment's two 500-watt heaters and one 1,000-watt heater are controlled individually and will be switched on in turn, applying heat that will increase steadily in 500-watt increments up to a maximum of 2,000 watts.

The experiment will be activated for two complete orbits in each of two different attitudes, the first with the payload bay toward Earth and the second with the Orbiter's tail toward the Sun. The heaters will go through a complete 500-watt to 2,000-watt cycle for each activation.

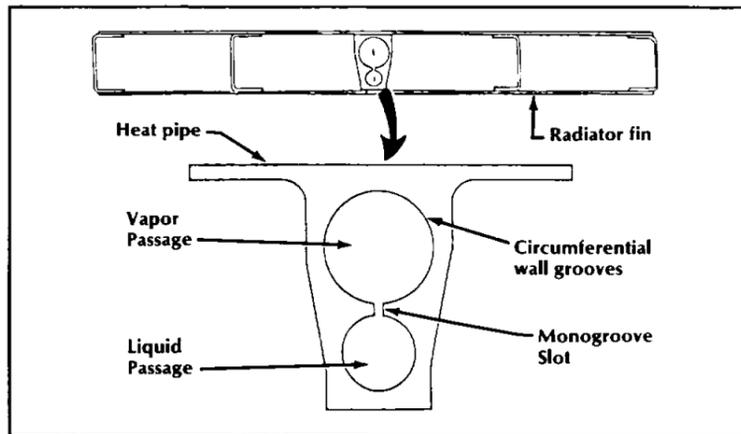
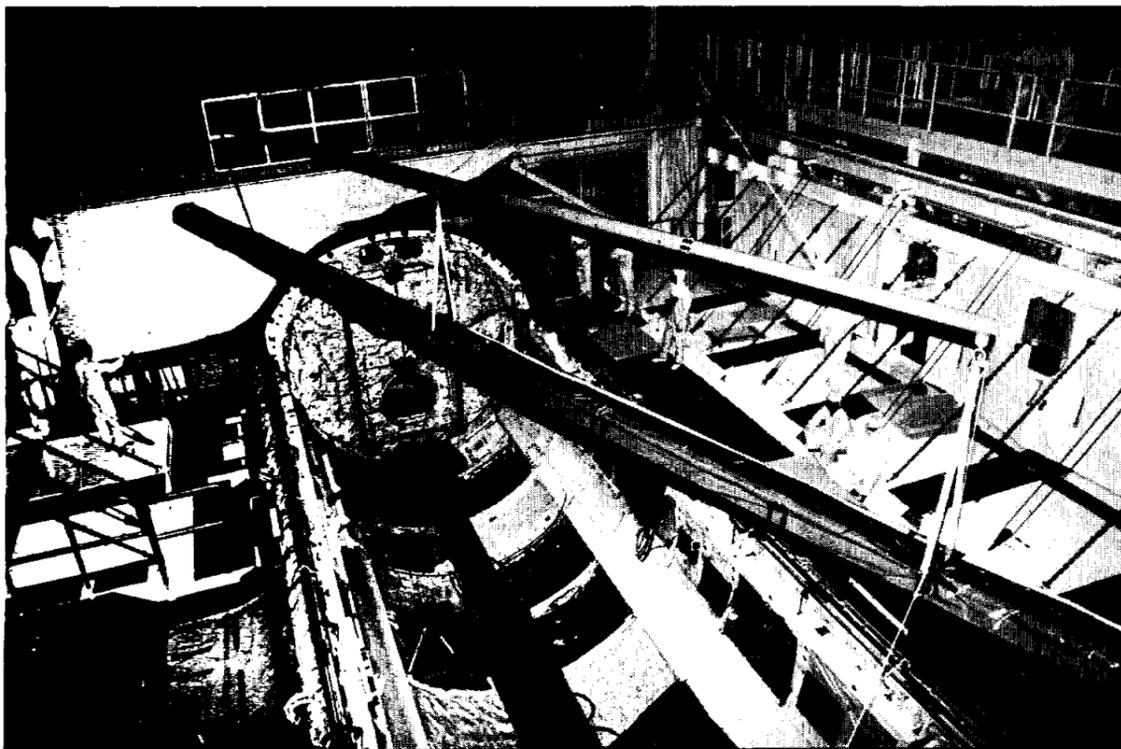
"The goal is to simulate the heat that will need to be dissipated from the space station," Rankin explained. The two attitudes will provide data on the heat pipe's operation in differing thermal environments: the payload bay facing Earth is a warmer situation than the tail-to-Sun attitude. On Space Station Freedom, the radiators would keep their edges facing the Sun, thus shading most of their surfaces.

Other information also may be obtained during STS-29 if possible, including a test of the heat pipe's minimum operating temperature, thought to be about minus-20 degrees Fahrenheit, and a test of its ability to recover from acceleration. The crew may fire the Orbiter's aft reaction control system thrusters for about six seconds, an action that would push the fluid in SHARE to one end of the pipe. The heaters would then be turned on again to see if the heat pipe will automatically reprime itself and resume operation.

For the space station, 50 to 100 radiator panels such as SHARE's would make up two arrays along the station's truss structure. Each radiator panel will operate independently, thus preventing the failure of a single panel from disabling an entire array.

SHARE is a passive heat pipe experiment. A more active flight experiment, the Shuttle Radiator Assembly Demonstration (SRAD), is planned for a future flight. Once the concept is proven by SHARE, scenarios for assembly of the radiator panels will be played out during a Shuttle mission, Project Engineer Steve Glenn said.

"We'd like to show how you'd put a bank of these together, and the assembly techniques would involve extravehicular activities and the RMS," Glenn said. Three different methods are being studied and would need to be evaluated with hands-on criteria: one using only the RMS; another using two spacewalking astronauts, one flying a manned maneuvering unit (MMU); and a third combining a spacewalking crew-member and the RMS.



Top: Jerry Woodfill, left, designer of the instrumentation and control package for the Space Station Heat pipe Advanced Radiator Element (SHARE), and SHARE Project Engineer Steve Glenn inspect a radiator element model. Behind them is a pedestal similar to those that will hold the experiment on an edge of *Discovery's* payload bay on STS-29. The pedestal was built by JSC's Technical Services Division. Left: SHARE is readied for installation in late November 1988 at Kennedy Space Center's Orbiter Processing Facility. Above: A cut-away diagram shows how SHARE's heat pipe is configured. The larger "pipe" will carry ammonia vapor containing heat to be radiated into space. The smaller pipe will carry liquid ammonia back to the heating elements.

Budget includes \$36.9 million for JSC construction

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Highlights of the budget request include:

- \$2.1 billion would go toward space station work, \$820 million of which would go to JSC. The \$820 million would represent a 173 percent increase in station funding at JSC.
- \$36.9 million would go toward construction of facilities at JSC, an

\$11.9 million increase for the center. Facilities to be under way include: a \$10.5 million third addition to the Bldg. 9A-9B complex; a \$17.8 million addition to the Mission Control Center to house space station flight control; a \$3.8 million addition to Bldg. 5; \$2 million in modifications to Bldg. 32 to create an expanded solar simulation capability; and a \$2.8 million rehabilitation of the Central

Heating and Cooling Plant.

- \$127 million is included for continued work on the National Aerospace Plane (NASP), a joint project with the Air Force.
- A NASA-wide increase of 700 civil service employees is included in the budget request. Of the new positions, 142 are earmarked for JSC.
- Funding is included to begin work on the Comet Rendezvous and

Asteroid Flyby (CRAF) scientific probe and the Cassini probe to explore Saturn and several of its moons.

- The budget reflects plans to seek private funding for several projects, including the Flight Telerobotic Servicer (FTS) for space station; solar dynamic power; a space station docking module; ground-based facilities for the ASRM, space

station processing and neutral buoyancy astronaut training; and for government use of a commercially developed space facility with funding to begin in 1992.

- The budget includes funds for joint NASA-Department of Defense development of a heavy lift booster—the advanced launch system (ALS)—but contains no funding for development of a Shuttle-C cargo carrier.



Student experimenter John Vellinger, standing, discusses his chicken embryo experiment with the STS-29 crew.

Animals to get taste of zero-G

By James Hartsfield

Animals will travel to space aboard *Discovery* on STS-29 and the experiments they'll be involved in may provide valuable information on the difficulty humans could have living in orbit for long periods.

Chicken eggs and rats—the focus of two student experiments—will be among the Shuttle's scientific cargo. The fertilized eggs are part of an experiment to determine the effect weightlessness has on the development of embryos. The rats will be part of a test to determine how well bones heal in space.

John Vellinger, a Purdue University student, created and designed the chicken embryo experiment that may gauge the feasibility of raising chickens as food in space. The experiment also may provide information on whether human embryos could develop normally in weightlessness.

Vellinger's experiment, sponsored by Kentucky Fried Chicken, Inc., will consist of 32 fertilized chicken eggs housed in an incubator, cushioned against any shocks during launch and landing. Part of the group will be 2 days old and the rest will be 9 days old, both

critical stages of egg development. An identical group of eggs will be placed in an incubator on the ground as a control group.

Vellinger has been working on the experiment for nine years. "This will be the first incubator of its size to fly in space, and these will be the first chicken eggs to be put in space," Vellinger said. "What we are doing is on the edge of the frontier as far as what we're trying to gain scientifically."

The experiment may show that chicken embryos actually develop easier in weightlessness than they do on Earth. Under normal gravity, the embryo of a chicken egg will sink to the bottom and stick against the shell, and a hen must regularly turn her eggs to avoid the problem.

But in weightlessness, the embryo will remain suspended in the middle of the egg, eliminating the need to turn them. However, other changes in the embryos' development can't be predicted, Vellinger said.

Andrew Fras, a pre-med student at Brown University, is the creator of an experiment that will place four rats as passengers aboard *Discovery*.

Fras' experiment will study the way bone heals in weightlessness. The four rats will have slight holes drilled in non-weight bearing bones, and the progress of their healing will be recorded and studied.

"From the beginning of our experience with spaceflight, we've realized that ... weightlessness has a tremendous impact on the structure of bone," Fras said. "But nothing of this nature has ever been done before in space. We don't know what will happen to a bone broken in space. This obviously has tremendous implications for any future treatment we may wish to undertake were such an event to occur."

The leg wounds will be induced on a non-weight bearing portion of the rats' legs under surgical conditions and anesthesia just prior to the loading of the experiment package onboard the Shuttle. The rats will be housed in a shelter that will take the space of a middeck locker, and the crew will have no contact with the animals.

Throughout the flight, the rats' progress toward healing will be recorded. The information will be compared with data from an identical experiment on Earth.

STS-29 crew has full schedule

(Continued from Page 1)

experiment and the Orbiter Experiments Autonomous Supporting Instrumentation System (OASIS).

Middeck payloads will include two student experiments, one exploring the healing of bone in space and another gathering data on chicken embryo development, plus the Chromosomes and Plant Cell Division (CHROMEX) and Protein Crystal Growth (PCG) experiments. The IMAX motion picture camera, a special camera for high-quality, wide-angle films, also will be in the middeck.

In addition, the crew will perform a variety of other tasks, including various medical test objectives, an attempt at detailed photography of the external tank following separation, an Inertial Measurement Unit reference test and an attempt at either a crosswind or braking study upon landing.

Another interesting objective, Coats said, will be an attempt to dump waste water from the Orbiter over a specially arranged observation point on the ground to gather data on its visibility.

Blaha will work with the IMAX camera, taking various films of Earth features and the TDRS-D deployment for a film to be called "The Fragile Planet Earth."

"Some of the things we'll be trying to film include an active volcano in Nicaragua, deforestation in Brazil and erosion in Madagascar," Blaha said.

Thanks to the success of STS-26, two satellites will support STS-29 by providing communications with the ground for about 85 percent of each orbit, a big change from the previous 50-percent coverage. *Discovery* will be out of contact with the Mission Control Center for only 13 minutes of each revolution as it passes

through a "zone of exclusion" over the Indian Ocean.

"Sometimes in the past, we've relished the times when we can't talk to the ground," Coats said. "And I'm sure we'll look forward to that little strip over the Indian Ocean."

Meanwhile, at Kennedy Space Center, final preparations are being made to ready *Discovery* for transfer to the Vehicle Assembly Building (VAB) on Thursday. *Discovery* is to be mated to the external tank and solid rocket boosters in the VAB, and the Shuttle is scheduled to be rolled out to the pad at 12:01 a.m. Jan. 26.

Springer and Bagian were at Kennedy Monday to perform the crew equipment interface test and an inspection of *Discovery's* payload bay for sharp edges that could interfere with a spacewalk. Both events went well, as have all continuing closeouts of the Orbiter prior to its move.

Spacelab payload specialists picked

NASA's Dr. Roger K. Crouch and Dr. Ulf D. Merbold of the European Space Agency (ESA) on Wednesday were appointed candidate payload specialists for materials sciences experiments for the International Microgravity Laboratory (IML-1) mission aboard the Shuttle Columbia in April 1991.

NASA also announced that it has extended to the government of Canada through the Ministry of State (Science and Technology) an invitation to nominate two candidate payload specialists for life sciences experiments on the IML-1 mission. Canada has accepted this invitation and nominated Dr. Roberta L. Bondar and Dr. Kenneth Money for the mission.

After the initial training period, NASA will designate, in consultation with ESA, a prime and a backup payload specialist for the materials sciences portion of the IML-1 mission and will also designate, in consultation with Canada, a prime and backup payload specialist for the life sciences portion.

IML-1 is the first of a series of microgravity investigations using the

Spacelab module. It will focus on materials and life sciences, two disciplines needing access to a laboratory in reduced gravity. IML-1 will use the Spacelab long module and is a dedicated microgravity mission.

The investigations will use five life sciences experiment facilities, designed to be used and flown again: biorack, protein crystal growth facilities, gravitational plant physiology facility, microgravity vestibular investigations and space physiology experiments; and three materials facilities: fluid experiment system, vapor crystal growth system, mercury-iodide crystal growth system and the critical point facility. These reusable facilities have been built by U.S., European, Canadian and Japanese investigators and organizations for reflight aboard the NASA-ESA Spacelab system.

Columbia will fly in a 160 (nautical) mile-high 28.5 degree orbit. Mission duration is 9 days and the crew will consist of two payload specialists and five additional astronaut/mission specialists. The orbiter will fly in a tail-down attitude called "gravity gradient" which produces the fewest gravitational disturbances.

Manifest sets six ELV launches

(Continued from Page 1)

satellite, is to be launched aboard *Atlantis* on April 28. Galileo, a cooperative project with Germany to survey Jupiter and its moons, is to be launched aboard the same Orbiter on Oct. 12. *Atlantis* also will carry *Ulysses*, a cooperative project with the European Space Agency to investigate the properties of the Sun and its environment, into space in October 1990. Each of the probes will be placed on its interplanetary trajectories by an Inertial Upper Stage (IUS).

Syncom-IV, a geosynchronous communications satellite, will be launched on STS-32. After the satellite is launched, the crew will retrieve LDEF, a package of experiments designed to study long-term exposure to the space environment. LDEF has been in orbit since deployment by the crew of STS-41C in April 1984.

For the first time, the manifest lists complex secondary payloads to be carried in the Shuttle's payload bay.

Secondary payloads for STS-30 will include the Mesoscale Lightning Experiment (MLE), which will observe and record the visual characteristics of large-scale lightning from space using on-board television cameras, the Fluids Experiment Apparatus (FEA-01), a space commercialization middeck payload, and the Air Force Maui Optical Station (AMOS-02), which will calibrate ground-based electro-optical sensors and study on-orbit plumes using the Shuttle as a test subject. STS-32 also will carry IMAX-02, a large-format movie camera, as a secondary payload.

The expendable launch vehicle schedule calls for six launches in 1989, and a total of 29 expendable launches through September 1994.

Strategic planners meet at JSC

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with contractors the progress of JSC's strategic plan implementation, and share the latest findings of six Strategy Initiatives Teams formed in June 1988 to develop plans for attaining 18 near-term goals. The workshop also was a precursor to a strategy review this spring that will lead to publication of a revised JSC Strategic Game Plan "green book," he said.

The group listened to updates on NASA's and JSC's strategic direction, JSC's game plan implementation efforts, and status reports from the Technology Issues Team, NSTS Issues Team, New Initiatives Office, NASA/Contractor Strategic Planning Working Group, Mission Operations Implementation team and Space

Station *Freedom* Projects Office. Participants also broke into groups to develop and present their ideas on technology, external relations and strategic planning.

New Initiatives Office Manager Bill Huffstetler, leader of the Technology Issues Team, said the large turnout for the workshop was encouraging. Communication was free between NASA officials and all contractors, and the groundwork was laid for continued closeness. The discussion group dialogues were particularly candid and constructive, he said.

Cohen and Huffstetler said after the conference they were especially pleased with the support contractors have given a recently initiated study on human civil space requirements.

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